(60 / 007 / E / 0193 / 3 / 8)

D.G.E -HR.SEC. EXAMINATION MARCH - 2014

REGISTER NUMBER **606676**

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SUBJECT :

007 CHEMISTRY E

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Bundle No	Packet No	Script No

Marks in Words			Marks in Figures		

Designation	Number	Signature
A.E		
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அரசுத் தேர்வுகள் துறை
DEPARTMENT OF GOVERNMENT EXAMINATIONS

Script No. 0 8

Comp No. 60

Total Marks 149

HSE

விடைத்தாள் திருத்துனர் நிறைவு செய்ய வேண்டியவை

FOR THE USE OF EXAMINERS ONLY

வினாவாரியாக மொத்தம் Questionwise Total										பக்கவாரியாக மொத்தம் Pagewise Total			
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வினாவாரியாக மொத்தம்
Question-wise Grand Total 149

பக்கவாரியாக மொத்தம்
Page-wise Total 149

தேர்வு எழுதுபவர் செய்யக்கூடியவை மற்றும் செய்யக்கூடாதவை

Do's & Don'ts for Candidates

1. முகப்புச்சீட்டில் உரிய இடத்தில் கையொப்பமிட வேண்டும்.

   Put your signature in the Top sheet in the appropriate place.

2. விடைத்தாளில் ஒரு பக்கத்திற்கு 20 முதல் 25 வரிகள் வரை எழுதவேண்டும்.

   Write 20 to 25 lines in a page.

3. விடைத்தாளின் இருபுறத்திலும் எழுத வேண்டும்.

   Write answers in both sides of paper.

4. செய்முறைகள் யாவும் விடைத்தாளின் கீழ் பகுதியில் இடம் பெறவேண்டும்.

   All rough works must be done on the lower part of the page.

5. வினா எண் தவறாமல் எழுத வேண்டும்.

   Write the question numbers without fail.

6. இரு விடைகளுக்கிடையே இடைவெளி விட்டு எழுத வேண்டும்.

   Leave space between two answers.

7. வினாத்தாளின் வரிசை (A or B) எழுத வேண்டும்.

   Write the question paper booklet series. (A or B)

8. விடைத்தாளில் நீலம்/கருப்புமை கொண்ட பேனாவால் விடைகளை தெளிவாக எழுத வேண்டும்.

   Anwers must be legibly written either in Blue or Black ink pen.

9. விடைத்தாளில் எழுதாத பக்கங்களில் குறுக்குக்கோடு இடவேண்டும்.

   Cross the unwritten pages.

1. வினாத்தாளில் எந்தவித குறியீடும் இடக்கூடாது.

   No marking in the question paper.

2. விடைத்தாளை சேதப்படுத்தக் கூடாது.

   Don't damage the answer paper.

3. விடைத்தாளில் எந்த ஒரு பக்கத்திலும் தேர்வு எண்/பெயர் எழுதக்கூடாது.

   Don't write name / Register Number in any page of the answer book.

4. வண்ணக்கலர் கொண்ட பேனா/ பென்சில் எதையும் பயன்படுத்தக் கூடாது.

   Don't write with sketch colour pencils.

5. விடைத்தாள் கோட்டின் இடது பக்கத்தில் எழுதக்கூடாது.

   Don't write on the margin.

6. விடைத்தாள் புத்தகத்தின் எந்த தாளையும் கிழிக்கவோ/நீக்கவோ கூடாது.

   Don't tare / remove any page from the answer book.

DGE
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PART - I

1. a) $\lambda = \frac{h}{mv}$ ✓ 1

2. a) sp^3d^3 ✓ 1

3. a) $iz^* = z - sc$ ✓ 1

4. c) PH_3 ✓ 1

5. d) Cu^+ ✓ 1

6. b) $3d^5 4s^1$ ✓ 1

7. d) +4 ✓ 1

8. 2.00

9. a) Magnesium - Porphyrin ✓ 1

10. c) 6 α, 4 β ✓ 1

11. c) Unit cell ✓ 1

10

G.Ex. 54–1A

12. b) $q = 0$

13. b) are state functions

14. b) $K_1 = \frac{1}{K_2}$

15. b) deactivates the catalyst

16. b) mol litre^{-1} sec^{-1}

17. a) Protein

18. b) Glycerine

19. c) Dialysis

20. c) 13

0.1 N

21. a) CH_3MgI reacts with alcohol, giving methane.

22. d) comparatively inert

23. b) Williamson synthesis.

24. c) Ammoniacal silver nitrate.

25. b) Acid chloride > ~~Acid~~ Anhydride > Ester > Amide

26. c) Functional

27. c) Dimethyl amine

28. b) Diphenyl amine

29. a) waxes

30. b) cellulose

19

PART - II

31. Significance of negative electronic energy :

(i) Energy of an electron at infinity is arbitarily assumed to be zero.

(ii) When an electron moves and comes under the influence of the nucleus, it does some work and spends its energy in the process

9

22

(iii) Thus the energy of the electron decreases and becomes less than zero ie becomes negative.

(iv) This the significance of negative electronic energy.

33. P_2O_5 - is a powerful dehydrating agent.

P_2O_5 extracts water from many inorganic acids, amides etc. It acts as a powerful dehydrating agent.

1) $H_2SO_4 \xrightarrow[-H_2O]{P_4O_{10}} SO_3$

2) $2HNO_3 \xrightarrow[-H_2O]{P_4H_{10}} N_2O_5$

3) $RCONH_2 \xrightarrow[-H_2O]{P_4H_{10}} RCN$

Amide — nitrile

34. Uses of Helium:

(i) Because of its lightness and non-inflammability it is used in filling up air balloons for meteorological observations.

(ii) Because of its lightness it is used in inflating aeroplane tyres

(iii) A mixture of Helium and oxygen mixture is used in treating asthma

35. Transition metals → form complexes:

(i) Transition metals readily form complexes with molecules like (NH_3, H_2O, etc) and negative ions like (F^-, Cl^-, Br^-) etc called ligands

(ii) They readily form complexes due to two reasons.

1) Small size and high positive charge density.

2) Presence of vacant (n-1) d orbitals which are of appropriate energy to accept the unshared pairs of electrons from the ligands for bonding with them.

Eg: $[Cu(NH_3)_4]^{2+}$, $[Fe(CN)_6]^{4-}$

36. gold with aquaregia:

Gold reacts with aqua regia (3 parts of conc. HCl and 1 part of conc. HNO_3) forming auric chloride.

$2Au + 9HCl + 3HNO_3 \longrightarrow 2AuCl_3$ (auric chloride) $+ 3NOCl \uparrow + 6H_2O$

(Aqua regia) (Nitrosyl chloride)

38. Vitreous state :

(i) Vitreous state or glassy state is a condition in which a substance can exist lying between solid and liquid state

(ii) Eg : Glass exists in vitreous state.

(iii) It exhibits the properties of amorphous solids and supercooled liquids as well.

6

40. **Reaction quotient (Q) :**

Reaction quotient (Q) of a reaction is defined as the ratio of product of initial concentration of the products to the product of initial concentration of the reactants under non-equilibrium conditions

Let $aA + bB \rightleftharpoons lL + mM$

$[A]$, $[B]$, $[L]$, $[M]$ are non-equilibrium concentrations.

$$Q = \frac{[L]^l \cdot [M]^m}{[A]^a [B]^b}$$

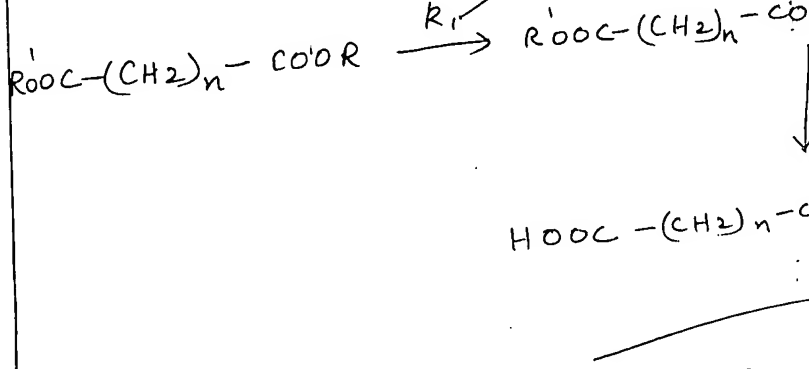
Consecutive reactants :

Consecutive reactions are reactions in which one or more reactants combine to form a intermediate compound and the intermediate forms the product under different rate constants.

$$A \xrightarrow{k_1} B \xrightarrow{k_2} C$$

reactant intermediate product

Eg: Saponification of deister in presence of alkali.



42. Activation energy :

The additional energy required by the molecules to attain the threshold energy in addition to the energy of the colliding molecules is called activation energy

Activation energy = (Threshold energy − Energy of colliding molecules)

(11) Higher the activation energy, less the rate of the reaction and vice - versa :

43.

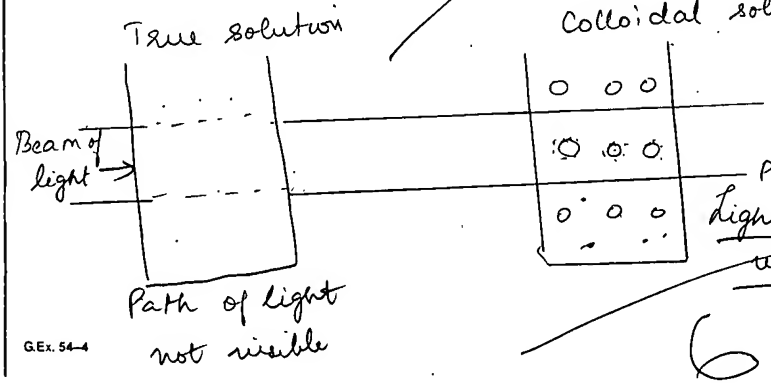
Tyndall effect :

When light is passed through a colloidal solution, the path of light becomes visible, when viewed at right angles.

The colloidal particles absorb light energy and emit in all possible directions.

This illuminates the path of the light beam.

This scattering of light by the colloidal particles in colloidal solution is called Tyndal effect.



6

44. Common ion effect:

The reduction in the degree of dissociation of the salt by the addition of a common ion in it is called common ion effect

Eg: $AgCl_{(aq)} \rightleftharpoons Ag^{+}_{(aq)} + Cl^{-}_{(aq)}$

AgCl in aqueous medium is in equilibrium with its ions. When a salt NaCl is added the concentration of Cl^- common ion will increase. Thus the equilibrium will shift towards the left forming solid AgCl.

Thus, the solubility of AgCl, a typically sparingly soluble salt in H_2O will decrease.

45. **Racemic mixture**

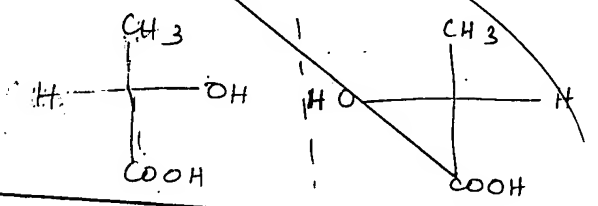
A mixture which contains both 'd' and 'l' pairs of substances in equal amounts is called racemic mixture.

The rotation towards clockwise direction by dextro isomer is compensated by the rotation of leavo isomer in opposite direction. Thus the molecule as a whole becomes inactive.

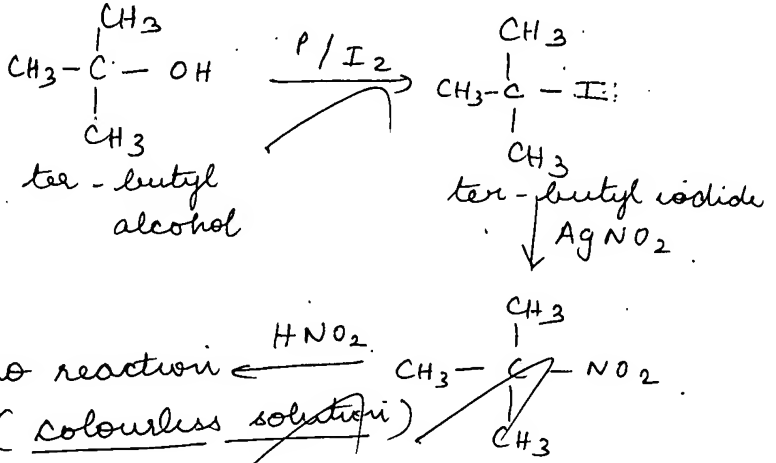
This inactivity is due to external compensation.

The two isomers can be seperated since they are in mixture form and this process is called Resolution of Racemic mixture.

Eg: equal amounts of 'd' and 'l' pairs of lactic acid



Ab. Victor meyer's test for 3° alcohol:



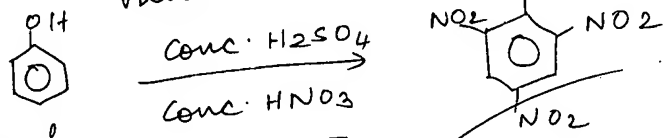
On reaction with 3° alcohol with P/I_2 ter-butyl iodide is formed which on treatment

with $AgNO_2$ gives nitro compound which further does not react with HNO_2.

Colourless solution remains showing it is a 3° alcohol by Victor Meyer's test.

47 Picric acid:

Picric acid is 2,4,6 trinitro phenol.



Phenol

2,4,6 trinitro phenol (Picric acid)

Phenol on nitrating mixture at 298 K gives 2-4-6 trinitrophenol which is picric acid.

48. **Urotropine**

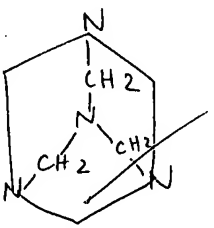
$$6HCHO + 4NH_3 \longrightarrow (CH_2)_6N_4$$

hexamethylene tetramine (Urotropine)

Formaldehyde reacts with ammonia to form urotropine.

Use:

It is an urinary antiseptic



Urotropine – structure.

49 Trans-esterification :

$CH_3COOCH_3 + C_2H_5OH \xrightarrow{H^+} CH_3COOC_2H_5 + CH_3OH$

methyl acetate — ethanol — ethyl acetate — methanol

When methyl acetate reacts with ethanol in presence of acid gives ethyl acetate and methanol. This process is called trans-esterification.

PART - III SECTION - A :

53. Extraction of zinc :

(B) Zinc is extracted from zinc sulphide (ZnS)

6

Concentration :

The ore is concentrated by froath-floatation process

Roasting :

The concentrated ore is roasted with excess of air at 1200K to form zinc oxide in reverberatory furnace.

$$2\,ZnS + O_2 \xrightarrow[\Delta]{1200\,K} 2\,ZnO + 2S$$

Reduction :

The ZnO formed is then reduced by coke by heating it in a fire clay crucible at 1673 K.

$$ZnO + C \xrightarrow{1673\ K} Zn + CO.$$

Electrolytic Refining :

Cathode : Thin sheet of pure Zn.

Anode : Thick sheet of Zn (impure)

Electrolyte : $ZnSO_4 + H_2SO_4$ (dil)

On electrolysis pure Zn from anode get deposited at cathode.

54 (5) Lanthanides extracted from monazite sand :

Lanthanides are extracted from monazite sand as follows,

Monazite

Heat with H_2SO_4 at 210°C for several hours

Gray mud

Unreacted sand containing ZnO_2, SiO_2, $ZrSiO_4$ etc. (Recycle sand)

Filtrate containing Ln^{3+}, H_3O^+, Th^{4+}, Lu^{4+}, HSO_4^-, SO_2^{2-}, HPO_4^-

Neutralised to proper acidity (or) added HF

Precipitate of Th (or) Precipitate of $Th_3(PO_4)_4$

Precipitate containing lanthanide and phosphate ions

NaOH (or) oxalic acid

Lanthanide hydroxides (or) Oxalates

Individual metals are prepared by suitable physical methods

Anhydrous Fluorides and Chlorides of Ln $\xrightarrow[1270K \,/\, Ca]{\Delta \,/\, Ar}$ Oxides of Lanthanum.

Lanthanide hydroxides. Impure $\xrightarrow[\Delta]{Ca \& Li}$ Pure metal.

SEC - B

5(b) Characteristics of free energy:

(i) 'G' fulfils free energy is $G = H - TS$ where H, and S are enthalpy and entropy of system. ΔG and G are thermodynamic state functions ($\Delta G = \Delta H - T\Delta S$)

(ii) G is an extensive property but $\Delta G = G_2 - G_1$ which is free energy change between the initial and final states becomes a intensive property when the system is in equilibrium or the masses remain constant if the system remains at closed system

(iii) 'G' has a single value of thermodynamic state of a system

(iv) G and ΔG are exclusively for system only

ΔG is negative - system is spontaneous.

$(\Delta G < 0)$

$\Delta G = 0$ system is in equilibrium

$\Delta G > 0$, system is non-spontaneous (non-feasible)

(v) $\Delta G = \Delta H - T\Delta S \longrightarrow (1)$

By 1st Law of thermodynamics

$\Delta H = \Delta E + P\Delta V$

and also $\Delta E = q - w$

$\therefore \Delta H = q - w + P\Delta V \longrightarrow (2)$

sub- (2) in (1).

$\Delta G = q - w + P\Delta V - T\Delta S$

we know that $\Delta S = \frac{q}{T}$

$\therefore \Delta G = q - w + P\Delta V - T\frac{q}{T}$

$= q - w + P\Delta V - q$

$\Delta G = -w + P\Delta V$

$\boxed{-\Delta G = w - P\Delta V}$ Network

The decrease in free energy is equal to maximum work obtainable from the system except the work of expansion.

$$-\Delta G = W - P\Delta V = \text{network}$$

This is called network of the system.

Thus, the gibbs free energy change gives the maximum work obtainable like physical, chemical, surface work but not the work of expansion.

57. Relationship between K_p and K_c :

Consider a general gaseous equilibrium consisting of gaseous reactants and products.

$$aA + bB + cC \cdots \rightleftharpoons lL + mM + nN \cdots$$

where $[A], [B], [C] \cdots, [L], [M], [N]$ are concentrations of reactants and products respectively.

$$K_p = \frac{P_L^l \cdot P_M^m \cdot P_N^n \cdots}{P_A^a \cdot P_B^b \cdot P_C^c \cdots} \longrightarrow (1)$$

where K_p is equilibrium constant in terms of partial pressure.

In terms of concentrations,

$$K_c = \frac{[L]^l [M]^m [N]^n \cdots}{[A]^a [B]^b [C]^c \cdots} \longrightarrow (2)$$

K_c - equilibrium constant in terms of concentration

For any gaseous component 'i' in the mixture, its partial pressure is related to molar concentration c_i as

$$\boxed{c_i = \frac{P_i}{RT}} \rightarrow (3) \qquad \left(P_i = \frac{n_i}{V} RT\right)$$

$c_i = \frac{n_i}{V}$ where V is volume in litres.

(no. of moles per litre $= c_i$)

Sub (3) in (2).

$$K_c = \frac{\left(\frac{P_L}{RT}\right)^l \left(\frac{P_M}{RT}\right)^m \left(\frac{P_N}{RT}\right)^n \cdots}{\left(\frac{P_A}{RT}\right)^a \left(\frac{P_B}{RT}\right)^b \left(\frac{P_C}{RT}\right)^c \cdots}$$

$$K_c = \frac{P_L \cdot P_M \cdot P_N \cdots}{P_A^a \cdot P_B^b \cdot P_C^c \cdots} \left(\frac{1}{(RT)}\right)^{(l+m+n\cdots)-(a+b+c\cdots)}$$

$$K_C = \frac{K_p}{(RT)^{\Delta ng}}$$

$$K_p = K_C (RT)^{\Delta ng}$$

where Δng = Total no. of stochiometric moles of gaseous products − Total no. of stochiometric moles of gaseous reactants.

Δng is +ve. $K_p > K_C$; Δng = −ve, $K_p < K_C$. $\Delta ng = 0$, $K_p = K_C$.

SECTION - C

60. (1) Isomerism in ethers:

Ethers exhibits two types of isomerism

(I) Functional

(II) Metamerism.

Functional isomerism:

This isomerism arises out of difference in the functional group attached to C atom.

Ethers are isomeric with alcohols.

They are of general formula $C_nH_{2n+2}O$.

	Ethers	Alcohol
C_2H_6O	CH_3OCH_3	C_2H_5OH
$C_4H_{10}O$	$C_2H_5OC_2H_5$ (diethyl ether)	$CH_3CH_2CH_2CH_2OH$ n-butanol
	$CH_3OCH_2CH_2CH_3$ methyl n-propyl ether	$CH_3-\underset{CH_3}{CH}-CH_2-OH$ iso-butyl alcohol
	$CH_3-\underset{CH_3}{CH}-O-CH_3$ methyl isopropyl ether	$CH_3-CH_2-\underset{OH}{CH}-CH_2$ sec-butyl alcohol
		$CH_3-\overset{CH_3}{\underset{CH_3}{C}}-OH$ tert-butyl alcohol

Metamerism:

These isomerism arise out of isomers having same molecular formula and same functional group but differ in the nature of alkyl group attached to C atom

Eg: $C_2H_5OC_2H_5$
diethyl ether

$CH_3OCH_2CH_2CH_3$
methyl n-propyl ether

$CH_3O-\underset{\underset{CH_3}{|}}{CH}-CH_3$
methyl - iso propyl ether.

6) Aldol condensation:

$CH_3CHO + CH_3CHO \xrightarrow{NaOH} CH_3-\underset{\underset{OH}{|}}{\overset{\overset{H}{|}}{C}}-CH_2CHO$

Acetaldehyde

3-hydroxy butanol
(Aldol)

(i) Two molecules of CH_3CHO condenses to form aldol

(ii) NaOH acts as a catalyst

(iii) One molecule acts as a carbanion and brings about nucleophilic attack on another carbonyl carbon of another acetaldehyde

Step I:

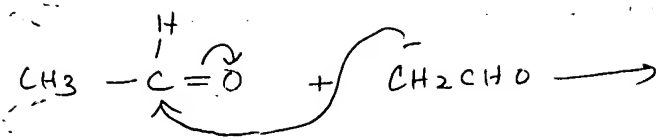
Formation of carbanion

$$CH_3CHO \xrightarrow{OH^-} \overset{\beta}{\overline{C}}H_2CHO$$

Carbanion

Step II:

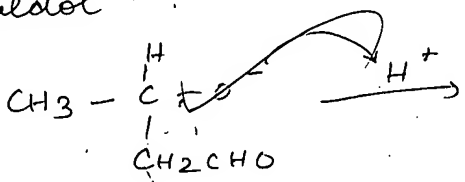
Nucleophilic attack of carbanion on another carbonyl carbon of another molecule of acetaldehyde.



(alkoxide ion)

Step III :

Protonation of alkoxide ion forming aldol



(aldol)

3-Hydroxy butanal.

Crossed aldol condensation :

$CH_3CHO + CH_3COCH_3 \rightarrow CH_3CH(OH)CH_2COCH_3$

Acetone.

follows the same procedure.

62. $HCOONa \longrightarrow$ Oxalic acid.

When sodium formate is heated with conc. H_2SO_4 at 673K it forms disodium oxalate

$$\begin{matrix} HCOONa \\ + \\ HCOONa \end{matrix} \xrightarrow[H_2SO_4]{673K} \begin{matrix} COONa \\ | \\ COONa \end{matrix} + H_2$$

disodium oxalate

When disodium oxalate is treated with $Ca(OH)_2$, the oxalic acid gets precipitated as calcium oxalate

$$\begin{matrix} COONa \\ | \\ COONa \end{matrix} + Ca(OH)_2 \longrightarrow \begin{matrix} COO \\ | \\ COO \end{matrix} \!\!>\!\! Ca + 2NaOH$$

Calcium oxalate

When Calcium Oxalate is treated with calculated amount of H_2SO_4, oxalic acid is formed

$$\begin{matrix} COO \\ | \\ COO \end{matrix} Ca + H_2SO_4 \rightarrow \begin{matrix} COOH \\ | \\ COOH \end{matrix} + CaSO_4$$

Calcium oxalate — Oxalic acid

The oxalic acid gets hydrated and form exist as $(COOH)_2 \cdot 2H_2O$ forming with 2 coordinated water molecules.

PART – IV

5 5 Postulates of Valence Bond theory :

65) a) (i) Every central metal atom makes itself available a number of vacant metal orbitals equal to its coordination number

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(ii) These vacant metal orbitals form covalent bond with the ligand orbitals

(iii) A covalent bond is formed by the complete overlap of vacant metal orbital with the ligand orbital. This complete overlap leads to the formation of metal ligand (σ) bond

(iv) A strong covalent bond is formed only when the orbitals overlap to a maximum extent, This maximum overlap is possible only when the metal orbitals undergo a

process called hybridisation. The hybridised orbital are more directional than an unhybridised one.

The coordination type, geometry, hybridisation is shown below.

Coordination type	Hybridisation	geometry
2	sp	linear
4	sp^3	tetrahedral
4	dsp^2	square planar
6	d^2sp^3	octahedral
6	sp^3d^2	octahedral

Magnetic moment:

The molecules which have unpaired electrons is called paramagnetic

The complexes which do not have unpaired electrons are called <u>diamagnetic</u>.

It is expressed in BM (Bohr Magneton)

Magnetic moment

$$\mu = \sqrt{n(n+2)} \text{ BM}$$

For $n = 1$

$$\mu = \sqrt{1(1+2)} = \sqrt{3} = \underline{\underline{1.732}}$$

b)

Chemical reactions	Nuclear reactions
(i) These reactions involve either loss or gain or overlap of outer orbital electrons forming products.	These reactions involve emission of α, β, γ rays from the <u>nucleus</u>.

(ii) The chemical equations are balanced in terms of mass only.	The chemical reactions are balanced in terms of both mass and energy.
(iii) The energy involved in these reactions is very much less when compared to nuclear reaction	The energy evolved is very much higher when compared to nuclear reactions
(iv) The energy involved is expressed in KJ / mol.	The energy involved is expressed in Million electron volt (MeV) per individual nucleus.
(v) No new elements or isotopes are formed as no nucleus is involved	New elements and isotopes are formed because they involve nucleus.

6 b)

a) Bragg's spectrometer method :-

(i) Bragg's spectrometer is the study of crystals using X-rays.

(ii) Bragg's spectrometer consists of a crystal mounted on a spectrometer table.

(iii) X rays from x-ray tube fall upon these crystal and get reflected.

(iv) The Bragg's spectrometer turn table is provided with scale and a vernier from which the angle of incidence 'θ' can be calculated.

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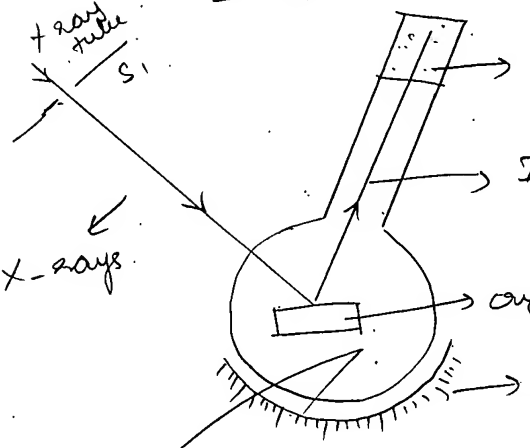
Bragg's Spectrometer



(v) The turn table is provide with an rotating arm which rotates about the same axis as the crystal table.

(vi) The diffracted X-rays from the crystal enter into the ionisation chamber and ionise the gas present inside.

(vii) The current of ionisation produced is measured for electron

(viii) This current of ionisation produced is a direct measure of intensity of reflected rays (X-rays) from the crystal.

(ix) For different angles of incidence 'θ' different current of ionisation is measured and plotted in a graph.

(x) For NaCl crystal, 100 plane, the maximum reflection of peaks occur for angles of incidence $\theta = 5.9°, 11.85°, 18.15°$.

(x) The series of the angles are 0.102, 0.205, 0.312 which are in the ratio 1 : 2 : 3

(xi) These values are in accordance with Bragg's equation.

(xii) Thus Bragg's equation is experimentally verified.

9) Preparation of colloids by chemical methods

Chemical methods are used to prepare colloids in which the dispersed phase is sparingly soluble in water.

(i) Double decomposition:

As_2S_3 sol can be produced by treating As_2O_3 gas with H_2S till yellow colour of the solution gets intensified.

$$As_2O_3 + 3H_2S \longrightarrow As_2S_3 + 3H_2O$$

(yellow)

Excess H_2S is removed by passing hydrogen in it.

(ii) Oxidation:

Sulphur sol is prepared by treating H_2S with SO_2 gas.

$$2H_2S + SO_2 \longrightarrow 3S + 2H_2O$$

(sulphur sol)

(iii) Reduction:

Au, Ag sol can be prepared by passing their salts in organic reducing agents such as formaldehyde and tannic acid

$AgNO_3 \xrightarrow{\text{tannic acid}}$ Ag sol.

$AuCl_3 \xrightarrow{\text{tannic acid}}$ Au sol.

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(iv) Hydrolysis :

Fe, Cr, Al sol can be prepared by hydrolysis of the salts.

$Fe(OH)_2$ sol can be prepared by hydrolysis of $FeCl_3$.

$$FeCl_3 + 3H_2O \rightarrow Fe(OH)_3 + 3HCl$$
(sol)

5x5

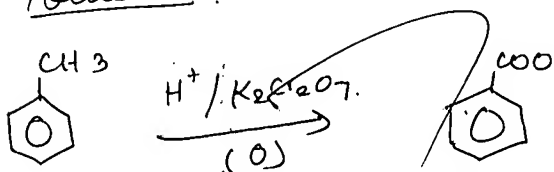
Enantiomers	Diastereomers
(i) The enantiomers have same magnitude but different direction	Diastereomers differ both in magnitude and direction

(ii) They have a configuration which is non-superimposable on its mirror image. They have a object mirror image relationship.	They are never mirror images.
(iii) They have identical physical and chemical properties but differ only in the direction of rotation.	They have diff physical proper
(iv) Seperation of enantiomeric pairs is a tedious process	Seperation fro other pair of enantiomers is easy
Eg: 'd', 'l' pair of lactic acid.	meso tartaric a with 'd' or 'l pair of tarta a

b) Benzoic acid prepared from:

(i)

(1) Toluene:



Toluene

Benzoic acid.

Toluene when treated with acidified $K_2Cr_2O_7$ forms benzoic acid oxidised product.

(ii) (ii) Phenyl cyanide:

$$C_6H_5CN \xrightarrow{H_2O} C_6H_5CONH_2 \xrightarrow{H_2O} C_6H_5COOH + NH_3$$

Phenyl cyanide

Benzoic acid

Phenyl cyanide on hydrolysis forms benzoic acid.

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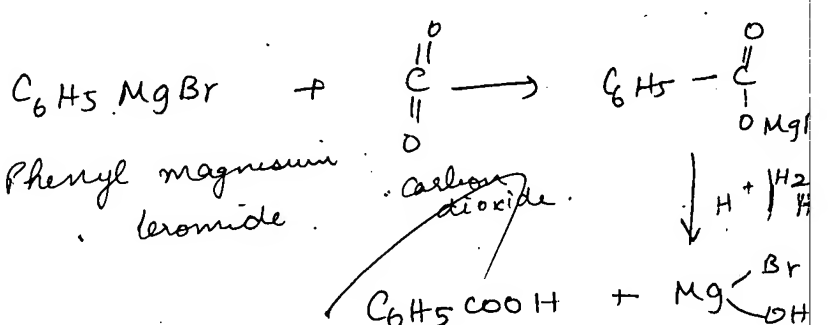
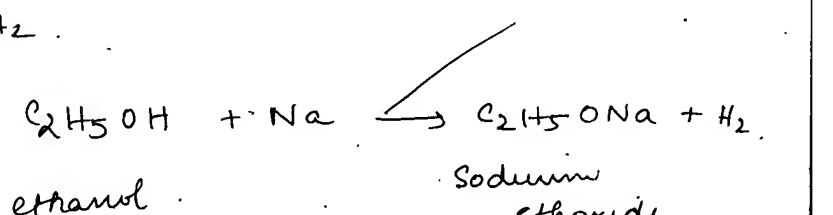
(iii) CO_2 :



Grignard reagent with CO_2 gi benzoic acid

10 a) Six The organic compound with molecular formula C_2H_6O is C_2H_5OH (ethanol) (A).

A on treatment with Na gives H_2.



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A on heating with conc. H_2SO_4 at 440K gives alkene (B)

$$C_2H_5OH \xrightarrow[440\,K.]{\text{conc. } H_2SO_4} \underset{\text{(B) ethene.}}{CH_2=CH_2} + H_2O.$$

B when oxidised with Baeyer's reagent gives ethylene glycol (C)

$$CH_2=CH_2 \xrightarrow[\text{cold. aq. alkaline } KMnO_4]{\text{Baeyer's reagent}} \underset{\text{(C) ethylene glycol.}}{CH_2OH-CH_2OH}$$

A C_2H_5OH. ethanol

B $CH_2=CH_2$. ethene

C CH_2OH-CH_2OH. ethylene glycol

b) The metal (A) extracted from sulphide ore is Ag (Silver) from Ag_2S

'A' on treatment with dil HNO_3 gives B also called Lunar caustics

$$3Ag + 4HNO_3 \longrightarrow 3AgNO_3 + NO + 2H_2O$$

Silver nitrate

'Lunar caustics (B)

B on heating with 773 K gives $2AgNO_3$ and O_2.

$$2AgNO_3 \xrightarrow[\Delta]{773K} 2AgNO_2 + O_2$$

Silver nitrate

Silver nitrite (C)

A Ag silver

B $AgNO_3$ silver nitrate (lunar caustic)

C $AgNO_2$ silver nitrite.